Intel® 810 Embedded Client Reference Design

Scalable Platform with Integrated Flat Panel Display

Application Note

June 2001

Order Number: 273550-001

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Revision History

Date	Revision	Description
June 2001	001	First release of the document

1.0 Introduction

The Intel® 810 Embedded Client Reference Design was developed to help OEMs and contract manufacturers quickly bring products to market. It is envisioned that individual OEMs will want to further customize this design to provide additional features or minimize cost.

Powered by an Intel Celeron™ processor, the reference design allows a terminal to be placed in demanding environments, such as the outdoors or in restaurant dining rooms and kitchens. The design also has a fanless thermal solution and a sealed electronics compartment that keeps internal components free of contaminants.

1.1 Architecture

The architecture of the reference design is based on a stable, proven, economical Intel 810 desktop platform. The design can accommodate the following socket 370 processors.

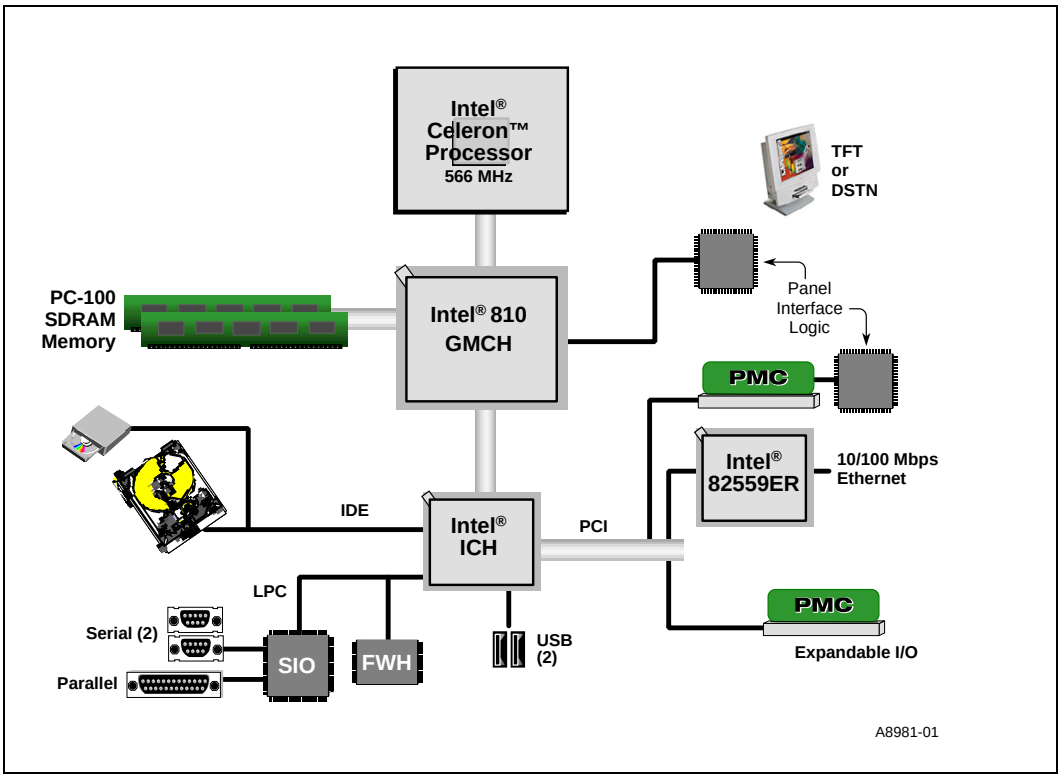
- Intel Celeron 300A MHz, 366 MHz, 433 MHz, and 566 MHz processors
- Intel Celeron 733 MHz and 850 MHz processors (fan required)
- Intel Pentium® III 600 MHz, 733 MHz, and 850 MHz processors (fan required)

1.1.1 Block Diagram

The block diagram in Figure 1 shows the following:

- PCI and I/O capability provided by the ICH
- Two USB ports
- A Super-I/O that provides support for keyboard, mouse, two serial ports and a parallel port
- Two populated IDE ports (chassis is designed to house only one desktop hard drive)
- Full AC’97 audio capability included from the 82801AA ICH.
- The Intel 82559ER Ethernet controller interfaced to the PCI bus to provide 10/100 Mbps LAN capability
- System expansion provided through the use of a PCMCIA card cage mounted on a PMC (PCI Mezzanine Card) that may be used to provide modem, wireless LAN, and other capabilities not envisioned during the design cycle
- Higher performance can be implemented through replacement of the 82810 GMCH, 82801AA ICH or both. For instance, the enhanced performance of the Intel 815e/82801BA ICH2 can be substituted.

Figure 1. Block Diagram



2.0 Video

Graphics capability in 2D and 3D is provided by the graphics controller built into the Intel 82810 GMCH.

An analog RGB connector is brought out to the I/O panel for easy interface to an external monitor.

This reference design was developed to support a built-in flat panel display. TFT and DSTN technologies are supported using two different approaches. TFT panels are supported using the Intel 82810 internal graphics engine coupled to a TFT translator circuit. DSTN panels are driven directly from an independent graphics engine interfaced through the PCI bus.

Additional details of the video implementation are contained in *Interfacing Flat-Panel Displays with Intel® Chipsets* (order number 273529).

2.1 Memory

The reference design is configured to support from 32 Mbytes to 256 Mbytes of SDRAM. Two DIMM sockets are installed. PC-133 SDRAM may be used, but the memory bus will be automatically configured to 66 MHz or 100 MHz, depending on which processor is selected for the application.

3.0 Power Supply

Power to all internal circuits is supplied by an on-board power supply that derives its power from an external AC to DC converter. This arrangement serves to conserve space and heat dissipation within the chassis while complying with International power specifications and safety standards.

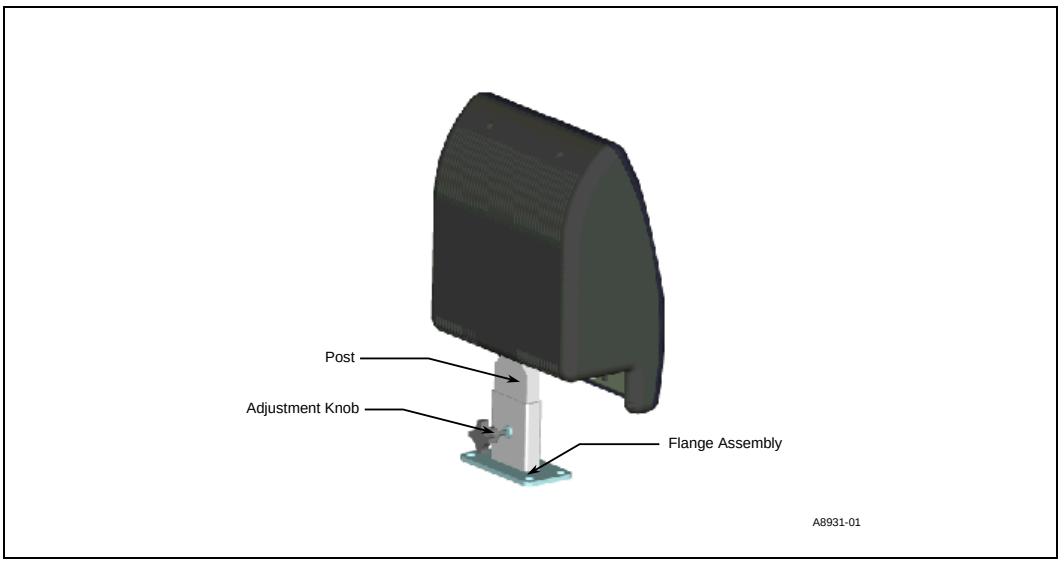
Details of the power supply design are contained in the *Intel® 810 Embedded Client Reference Design—DC-to-DC ATX Power Supply Application Note* (order number 273549).

4.0 Form Factor

Counter space is a valuable commodity in commercial environments; therefore, a dedicated client in this environment needs to have a relatively small form factor and flat panel display. The Intel Embedded Client Reference Design minimizes the form factor while accommodating for the size of its required internal components, such as printed circuit boards and a natural convection heat sink. At the same time, the graphics screen must be as large as economically feasible to attract users.

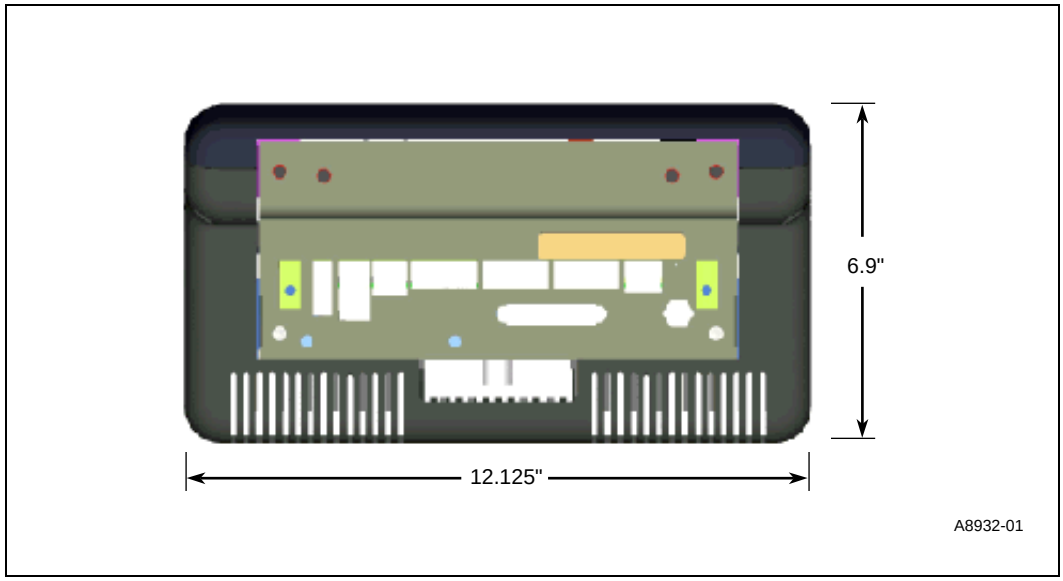
All of the design's elements are housed in a chassis that is attached to the counter via a flange and an adjustable post, as seen in Figure 2. This saves counter space and allows the user to adjust the height to a comfortable level.

Figure 2. Flange and Post



The footprint of the reference design is 83.67 in^2, as shown in Figure 3. The design of the dedicated client chassis uses curves and color schemes to make the unit appear even smaller.

Figure 3. Projected Footprint



Another feature that keeps liquids from contacting the I/O is a drip edge on the housing around the I/O plate. Liquid that is spilled or poured over the unit will run down the housing and drip off the bottom onto the counter surface. The drip edge prevents any seeping of the liquid onto the connectors and cables, thereby protecting the embedded client.

5.0 Thermal Solution

The reference design uses passive cooling, which eliminates all fans and the failures and maintenance that often accompany fan bearings. The design also eliminates dirt and grease that is brought into a system with forced air. In addition, acoustical noise is reduced, contributing to a more positive human interface environment.

The reference design operates at temperatures up to 50º C to enable deployment in outdoor or kitchen applications.

Note: Natural convection cooling is optimized for processor thermal design power (TDP) of 20 W, maximum junction temperature (Tjmax) of 90° C and ambient temperature to 50° C. Other combinations are possible, but must be carefully designed to ensure proper operation.

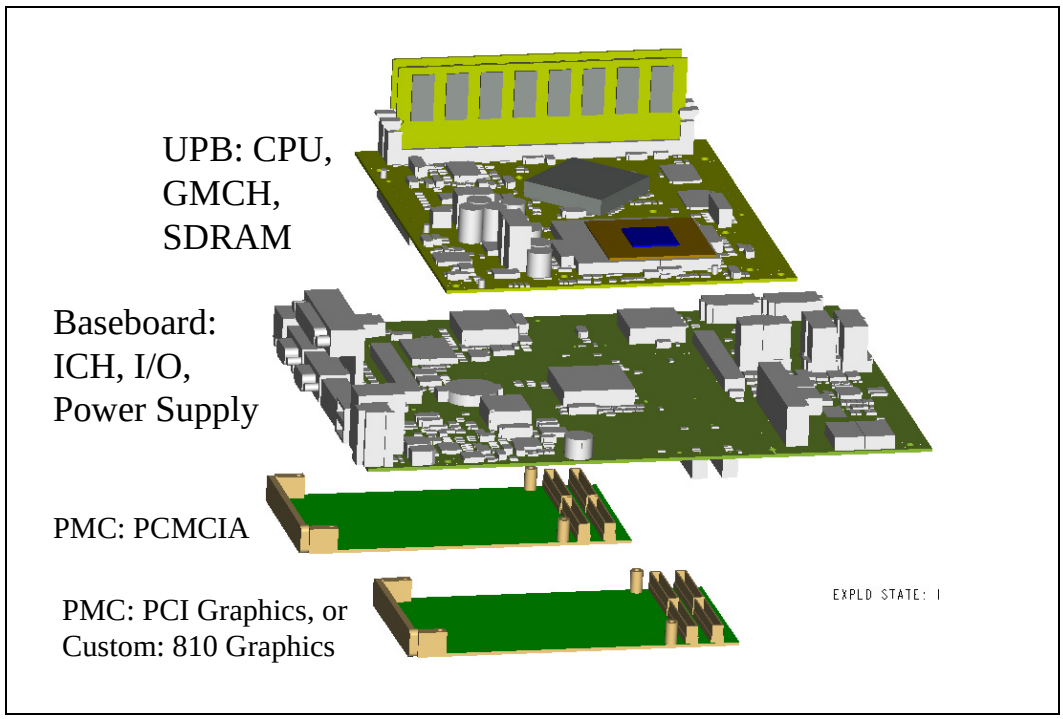
6.0 System Partition

The reference design fits behind a 10” flat panel display. To minimize system volume, the system board is partitioned into two boards. One board contains the processor, Intel 810 GMCH and memory. The second board contains the 82801AA ICH, all I/O, PMC connectors and the power supply.

In addition, two PMC slots are provided. The first is used for a graphics interface. The second slot is a general PCI expansion PMC. A two-slot PCMCIA card cage is used to provide a variety of I/O options. The use of PMCs preserves a flat form factor needed to minimize the design's volume.

Figure 4 shows the PC boards that make up the reference design.

Figure 4. System Partitioning



See the *Intel® 810 Embedded Client Reference Design—Hublink System Partitioning Application Note* (order number 27354701) for details on splitting the hublink.

7.0 Chassis Design

In a commercial environment where dedicated clients are used, there can be chemicals, liquids, or greases located near the unit. When these contaminants come in contact with most systems, the systems can be damaged or destroyed.

The Intel 810 Embedded Client Reference Design has a sealed (not hermetic) electronics compartment to keep it free of contaminants. When a liquid is spilled on the chassis, the liquid runs down the housing and falls to the counter surface. If a liquid comes in contact with the rear housing, vents allow the liquid to enter the chassis and come in contact with the heat sink. Because the electronics compartment is sealed off by the heat sink, contaminants do not come in contact with the electronics. The rear housing exists primarily for aesthetic purposes and to prevent burns from accidental contact with the heat sink.

The design can also be made rain-proof for outdoor applications by using weatherproof I/O connectors.

The design has the following key features:

- Single seal interface between the carrier and front housing
- Sealed heat sink and carrier interface
- I/O through the bottom of the dedicated client
- Practical chassis shape

Figure 5. Chassis

7.1 Electronics Module and Carrier

The two main boards in the Embedded Client Reference Design are the base board and the universal processing board. These two boards are fastened to two plastic guides. The guides are then mounted to the three-piece carrier assembly as shown in Figure 6. This assembly makes up the majority of the electronics module, along with a hard drive and other ancillary electronics.

The main compartment of the electronics module is the three-piece carrier assembly. The carrier was designed as three pieces to reduce manufacturing costs. By injection-molding three planar elements, a small horseshoe-shape mold results. Shrinkage and deformation are also greatly reduced.

The client also includes the flat-panel display assembly, which is mounted to the front housing. The front housing and electronics module fit together and make up the electronics compartment.

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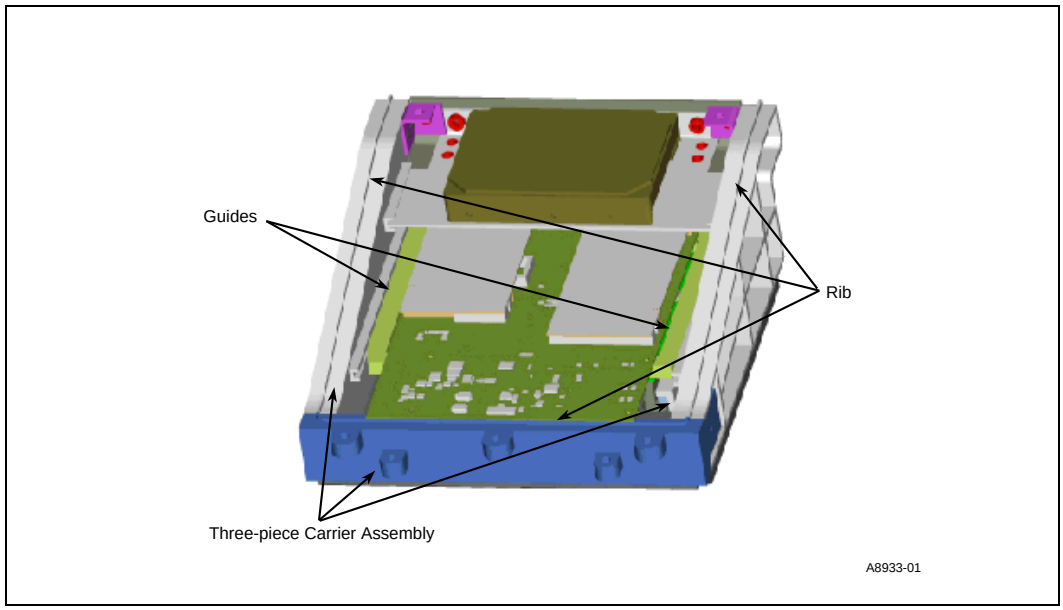
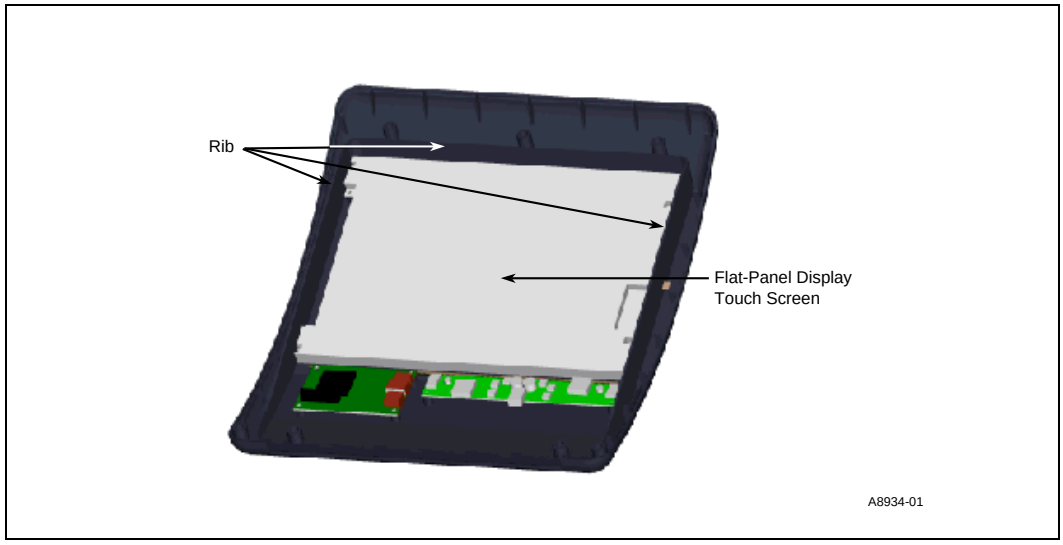
Figure 6. Electronics Module



7.2 Single Seal Interface

The reference design has a single seal interface between the electronics compartment and the outside. To achieve this, a rib in the three-piece carrier has a matching rib on the front housing that fits onto the carrier. A rubber D-ring is glued next to the rib on the carrier. When assembled, a seal cannot be penetrated by contaminants

Figure 7. Front Housing and LCD Assembly

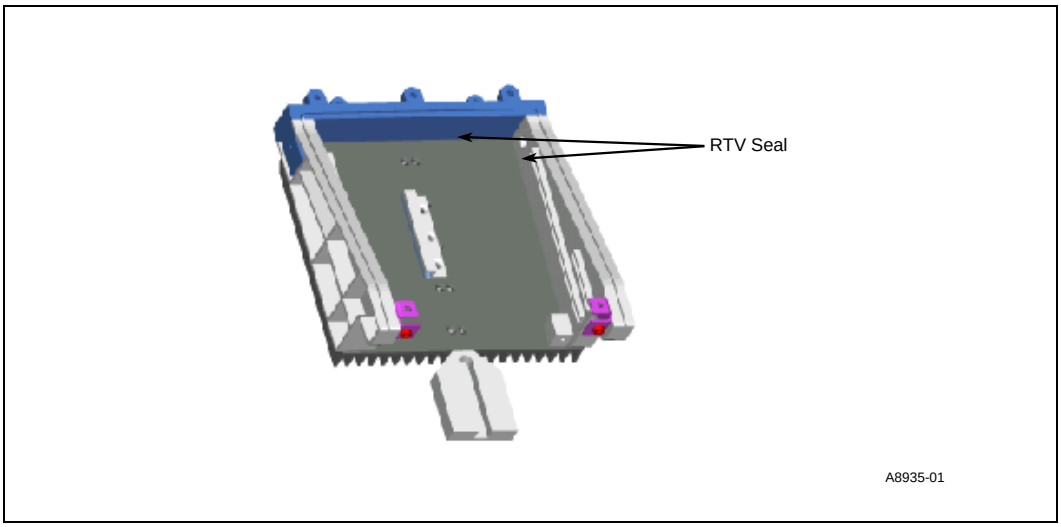


7.3 Heat Sink and Carrier Interface

The thermal solution for the dedicated client is large, but designed to take maximum advantage of volume allocation and not increase chassis size. The heat sink interfaces with the three-piece carrier and creates the back wall for the electronics compartment. To ensure that the electronics compartment is sealed from any contaminants that could seep in, the interface between the carrier and heat sink is sealed with a room temperature vulcanizing (RTV) adhesive, as seen in Figure 8.

The extruded aluminum heat sink is attached to the carrier and seals off the electronics compartment. It is designed to cool a 20 W processor with a junction temperature of 90º C and a maximum ambient temperature of 50º C. The rear housing of the chassis is used solely to protect the user from accidental contact with the heat sink.

Figure 8. Carrier and Heat Sink Seal

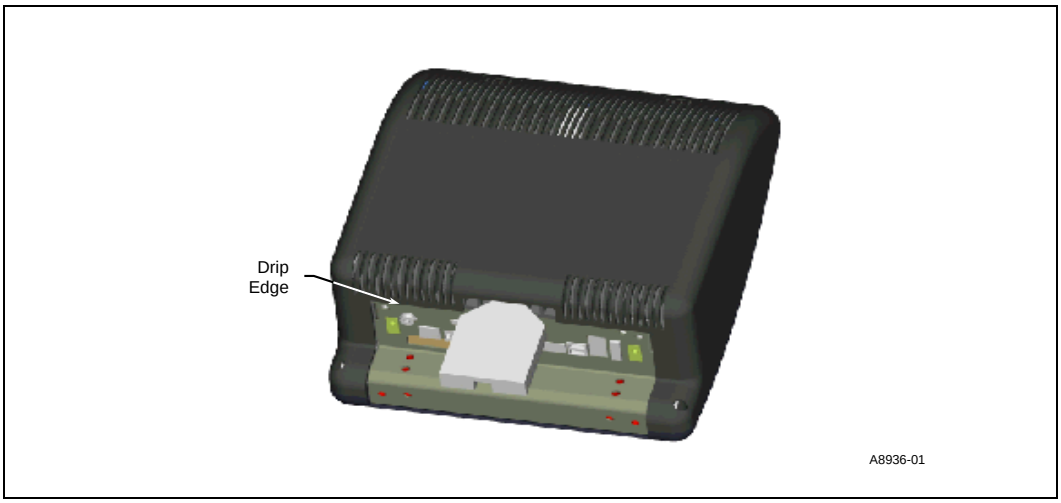


For more information on the design and theory of the thermal solution, see the *Intel® 810 Embedded Client Reference Design — Thermal Design Summary Application Note* (order number 273548-001).

7.4 I/O Windows Location

A key feature in preventing contaminants from entering the electronics is the location of the I/O connectors. The I/O plate is placed at the bottom of the client, but above the counter surface, to prevent contaminants from splashing up into the connectors. The positioning of the connectors and cables also keeps the I/O hidden, so a person could not disconnect anything by bumping into it accidentally. The I/O positioning is seen in Figure 9.

Figure 9. I/O Location



7.5 Serviceability

The Intel 810 Embedded Client Reference Design can be serviced in a very short amount of time. The design is equipped with a unique feature that allows quick disassembly by simply removing a few screws and disconnecting cables.

The internal components are mounted to an electronics module, which slides out of the chassis. This allows for easy removal of the internal components (see Figure 10 and Figure 11), and can reduce the mean-time to repair (MTTR) or upgrade.

The electronics module includes an integrated I/O plate that accommodates the placement of the connectors for the electronic components. The I/O plate also serves as the interface plate that is secured to the chassis in the assembled configuration.

The design also includes guide rails that interface with the PCBs. The guide rails stiffen the systemboards, include standoffs to separate the PCBs, and are used to guide the electronics module in and out of the chassis. The guide rails match up with guide features on the chassis to ensure proper assembly.

Figure 10. Electronics Module Removal

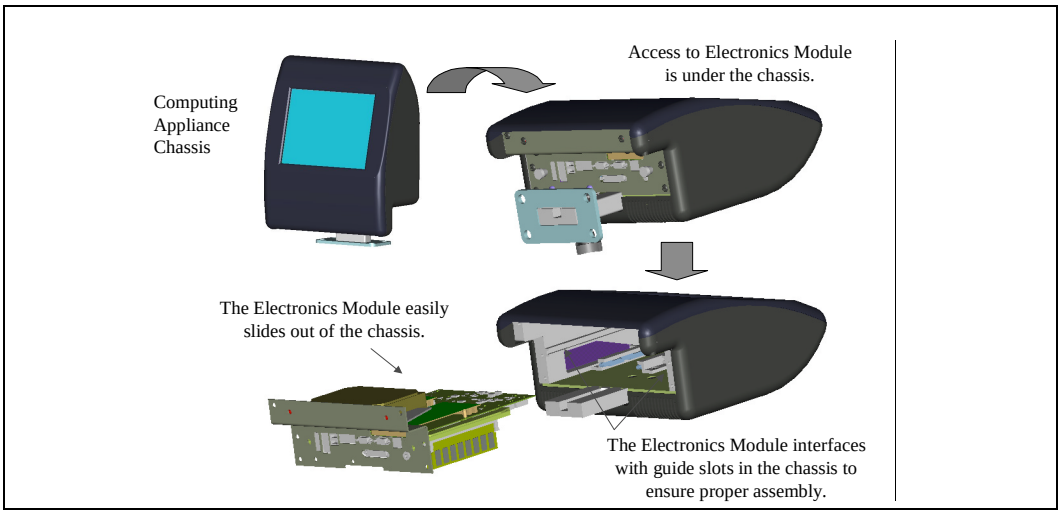
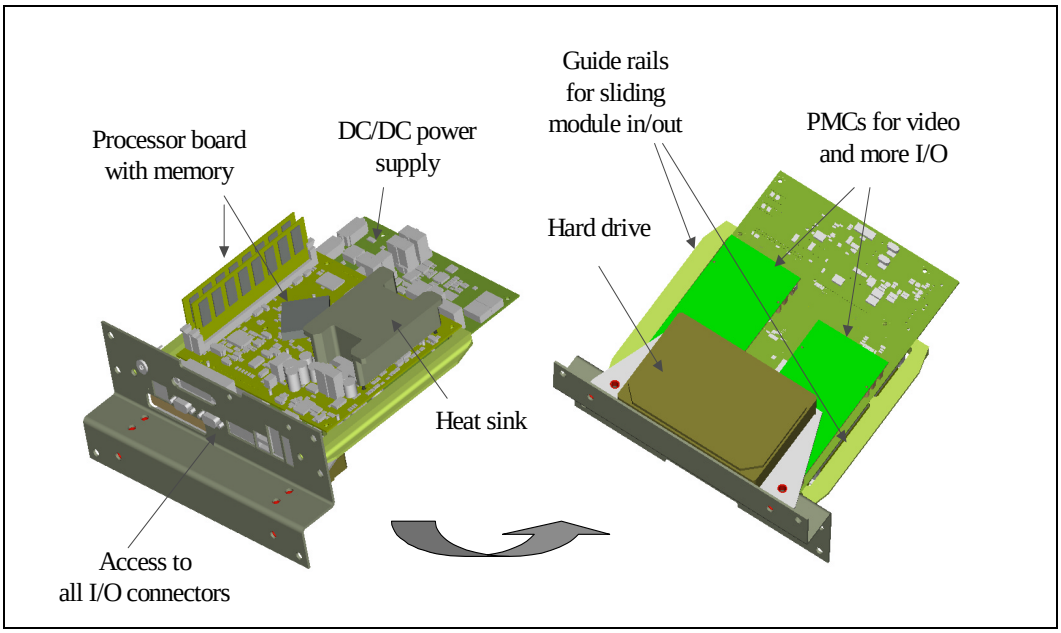


Figure 11. Electronic Component



8.0 Related Documents

Table 1. Related Documents

Document	Order Number
Intel® 810 Embedded Client Reference Design—Hublink System Partitioning	273547
Intel® 810 Embedded Client Reference Design—Thermal Design Summary	273548
Intel® 810 Embedded Client Reference Design—DC-to-DC ATX Power Supply	273549
Interfacing Flat-Panel Displays with Intel® Chipsets	273529